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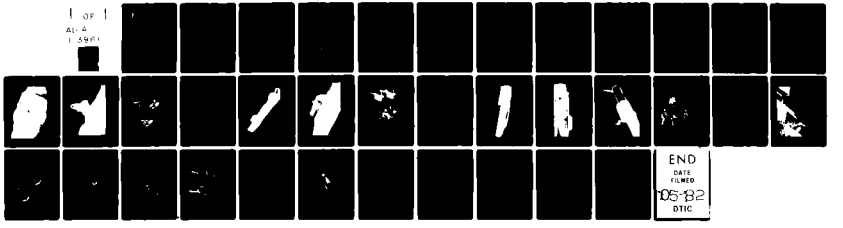

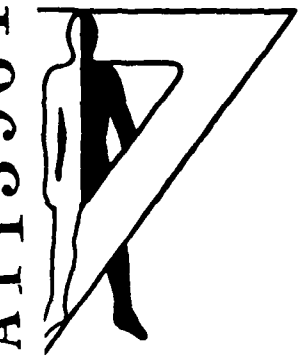

Technical Memorandum 29-78

SIMPLE MECHANICAL SIGHT DESIGNS FOR THE VIPER LIGHT ANTITANK WEAPON

Dominick J. Giordano

November 1978
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U. S. ARMY HUMAN ENGINEERING LABORATORY
Aberdeen Proving Ground, Maryland

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Peep and post sights for use on a light antitank weapon were designed and fabricated. Two types were examined. One type had a rear peep whose height was adjustable in 50-meter range increments and a rifle type front post. The other type had a fixed peep height and a front reticle with range lines. All sights had daylight and low-light level peeps, and were designed for a combination of fixed QE and conventional firing techniques. The adjustable peep designs were stored and erected set at a fixed QE (or battle-sight) range setting. End caps and shoulder stop designs were also examined. A modification of one sight design was selected for use on VIPER which will replace the M72A2 LAW.

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ACKNOWLEDGEMENTS

The design of sights and other weapon peripherals described herein was the culmination of a team effort. The team consisted of Messrs James P. Torre, Jr., Fred N. Newcomb, Paul H. Ellis, and R. Bruce Young. Primary credit for individual designs belongs to:

Sight A— the entire team

Sight B— Mr. Fred N. Newcomb

Sight C— Mr. Paul H. Ellis

Sight D— Mr. Paul H. Ellis

Sight E— The rear peep sight which uses the Human Engineering Laboratory's concentric peep design was designed by Mr. Jeff Lineau, US Army Missile Research and Development Command.

End cap and shoulder stop designs— Mr. Fred N. Newcomb

Double hinging front post— Mr. R. Bruce Young.

CONTENTS

SIMPLE MECHANICAL SIGHT DESIGNS FOR THE VIPER LIGHT ANTITANK WEAPON

INTRODUCTION

Background

The US Army Human Engineering Laboratory (HEL) investigated the performance of sights for light antitank weapons in the US Army Materiel Development and Readiness Command (DARCOM) Short Range Man-Portable Weapon Technology (SMAWT) program and recommended (1, p. 9) "that the sight for the SMAWT weapon should be a simple sight, integral to the weapon, such as a post and peep with adjustable range increments, combining fixed-QE and conventional firing." In subsequent US Army Missile Research and Development Command (MIRADCOM) technology programs, (LAW-T and I-LAW) HEL was tasked to (a) delineate the required human factors features for the new weapon, (b) determine the location of sights and trigger mechanism on the weapon, and (c) design prototypes of simple sights for the weapon. The first task was accomplished in a HEL Infantry Team combined effort; a listing of the required features is in Appendix A. Results of an experiment to determine the location of sights and trigger mechanism are reported in (2). The investigation described here is concerned with the design of simple sights.

The end products of this investigation were prototype sights mounted on fiberglass mock-up launch tubes and drawings and photographs of the sights which were forwarded to MIRADCOM for evaluation. The drawings and photographs were subsequently given to the contractor selected to develop a new light antitank weapon, VIPER, at an information transfer at MIRADCOM.

After developing and testing a weapon sight different from the HEL designs (and which appeared to be less expensive to produce), the VIPER contractor, General Dynamics, encountered insurmountable design problems and reexamined the HEL sight designs. A sight design which is a modification of the first sight discussed in this report was then selected for use on VIPER.

It should be noted that all of the sight designs described herein are prototypes and have more parts than a production version would have. For example, sight C is shown with six parts, but could be production molded in three pieces.

Purpose

The purpose of this investigation was to design and build prototype simple sights for use on a new light antitank weapon, VIPER.

METHOD

Types of Sights

Two general types of simple sights were considered: (1) a fixed rear peep and a front sight reticle with range lines (and lead lines) similar to the M72A2 LAW sight but no stadia lines; and (2) a rear peep sight which could be adjusted vertically in increments of range/superelevation and a front sight post similar to the one on the M16 rifle, but with lead marks.

Most of our efforts were directed towards the adjustable rear sight design and prototypes of this type of sight were fabricated. Sights using a front reticle were designed but were not fabricated.

Required Features

The sights were designed to incorporate the following features:

1. They would be stowed and erected set at the fixed QE (or battle sight) setting (for an adjustable rear sight).

2. They would have 50-meter range increments from 50 meters to 500 meters.

3. The range increments (on a rear sight) would provide tactile and audible feedback to the gunner.

4. The rear sight would possess both a daylight (2mm diameter) and a low-light (7mm diameter) peep aperture.

5. They would be stowed in a protective enclosure.

Firing Procedures with the Sights

All of the sights were designed for a combination of fixed QE and conventional firing techniques. By conventional firing, we mean that the gunner obtains range information visually (unaided range estimation) or from previously prepared sector cards (or in the future from a platoon or squad laser range finder), and selects a range increment on the sight which corresponds to the appropriate weapon superelevation. For fixed QE, the sight has a specially marked range/superelevation setting such that for target ranges as far as the fixed QE range, the gunner needs only to aim at the target and fire. The maximum range for fixed QE depends on target height and weapon muzzle velocity and is selected to ensure a hit probability close to unity against a tank target.

Firing procedures for a sight in which these two procedures are combined are to:

1. Use fixed QE if:

   a. A fully exposed tank target is at a range no greater than the fixed QE range setting, or

b. The gunner must fire quickly; e.g., his position is being overrun and the target is nearby.

2. Use conventional firing if:

a. Previous range information is available from sector cards (etc.).

b. A target is at a range greater than the fixed QE range setting.

c. A large portion of a tank target is concealed by terrain features.

d. The target is smaller than a tank.

The maximum range for fixed QE is influenced by the aiming point on the target as well as target height and weapon muzzle velocity. Bottom and center of the target are two typical aiming points, and bottom aim extends the maximum range compared to center aim.

For conventional firing, the aiming point should be the center of the visible portion of the target because all other US Army infantry weapons use this aim point, and it also makes sense to the soldier to aim at what he wants to hit. Base aim could be used, but performance against targets smaller than a tank would be degraded compared to aiming at the center, or else complex gunnery procedures would be required whereby the gunner aims at something other than what he wants to hit.

In designing the sights, we assumed center aiming on the target for conventional firing. We did not choose between bottom aim and center aim for fixed QE. Instead, we selected an arbitrary range between the maximum range for either aiming point on the target. Shifting aiming points in the design would require only a shift in a detent or an index point on the sight. However, we recommended using center aim for both firing techniques instead of center for conventional firing and bottom for fixed QE because it would simplify training and operation and would be less likely to confuse the gunner when he attempts to use the weapon.

Superelevation/Range Characteristics

Preliminary data from MIRADCOM indicated the new weapon would have a muzzle velocity of about 900 fps and a sight radius of 20 inches (VIPER muzzle velocity is higher and the sight radius is about 25 inches). Superelevation versus range for the prototype round, and the peep vertical offset for the ballistic characteristics of the weapon and a 20-inch sight radius, are shown in Table 1. These offsets were used in all sight designs.

Although we did not design (and recommended against using) a sighting procedure whereby the gunner aims at the bottom of the target for both conventional and fixed QE firing techniques, we computed the peep offsets required for a sight which incorporated this type of firing procedure. These data are shown in Table 2. Aiming at the bottom of the target for conventional firing would require that the aiming point be biased so the round is directed towards the target center. The superelevation bias for the sight is shown in column 4 of Table 2. Because higher superelevations are required for ranges both less than and greater than 150 meters, the minimum range for this sight design would be 150 meters.

TABLE 1

Characteristics of a Post and Peep Sight in Which the Conventional Method of Fire with "Center Aim" is Used

Range	Superelevation	Peep Vertical Offset	
Meters	Mils	Inches	Millimeters
50	3.4	0	0
100	6.8	.069	1.8
150	10.4	.141	3.6
200	14.1	.214	5.4
250	17.8	.289	7.3
300	21.7	.366	9.3
350	25.6	.445	11.3
400	29.7	.526	13.4
450	33.9	.610	15.5
500	38.2	.696	17.7

NOTE: 900 fps Muzzle Velocity
20-Inch Sight Radius

TABLE 2

Characteristics of a Post and Peep Sight in Which Conventional and Fixed QE Methods of Fire are Combined, and the Gunner Always Aims at the Base of the Target

Range in Meters	Superelevation in Mils (Ballistic)	Half-Target Height in Mils	Superelevation in Mils (Range Lines)	Incremental Peep Vertical Offset (Millimeters)	Peep Vertical Offset (Millimeters)
50	3.4	22.8	26.2		
100	6.8	11.4	18.2		
150	10.4	7.6	18.0	0.0	0.0
200	14.1	5.7	19.8	0.9	0.9
250	17.8	4.6	22.4	1.3	2.2
300	21.7	3.8	25.5	1.6	3.8
350	25.6	3.3	28.9	1.7	5.5
400	29.7	2.9	32.6	1.9	7.4
450	33.9	2.5	36.4	1.9	9.4
500	38.2	2.3	40.5	2.1	11.4

NOTE: 900 fps muzzle velocity
7.5 feet target height
20-inch sight radius

RESULTS

Sight A

Sight A consists of a peep mechanism with adjustable height or range increments and a housing in which the peep mechanism is stored in the down or stowed position. The peep has two hole diameters, a smaller one for use under daylight or normal lighting conditions and a larger one for use under nighttime or low-light level conditions. An insert containing the smaller peep hole is normally in position covering the larger peep hole. The smaller peep is retained in the normal position, concentric with the larger peep, by a raised cylindrical portion of the insert that fits into the larger peep hole. Figure 1 shows the peep mechanism in the stowed position and Figure 2 shows the peep in the up or ready-to-fire position. An artist's sketch in Figure 3 shows the movement of the sight from the stowed to the up position, the vertical movement of the peep, and the overall dimensions of the sight housing. An exploded view showing the component parts of the peep is also contained in this figure.

The range setting on the sight is adjustable in 50-meter increments from 50 meters to 500 meters. Range is adjusted with the right-hand knob and is indicated on the left-hand knob. A detent provides a tactile cue to the gunner at each range increment. The initial setting on the sight when it is in the stowed position (and when the sight is placed in the up position) is the battle sight range setting. A cut-out in both sides of the sight housing allows the range knob to be seated in the housing only when the battle sight setting is set on the sight.

To place the sight in the up position, the gunner grasps the end plates on the range selector between the right thumb and index finger and rotates the sight upwards and rearwards. To prevent the gunner from inadvertently changing the range setting when the sight is placed in the up position—which is caused by a counter rotation of the range selector when the sight is rotated upwards—the range selector end plates rotate freely about the range selector.

To change the range setting with the sight in the up position, the gunner grasps the knurled range selector knob between the right thumb and index finger and rotates the knob away from himself to increase range or towards himself to decrease range.

To change from the smaller to the larger peep, the peep insert is pulled slightly rearwards (with the right index finger) and rotated to the right and down until the smaller peep is directly below the larger peep. The smaller peep can be placed back in position by reversing this procedure and rotating the insert until the raised cylindrical portion of the insert snaps into the larger peep.

To return the sight to the down position, the gunner places his right thumb on the rear edge of the knurled range selector knob and pushes forward and downward to rotate the sight away from himself. If the initial range setting has been changed, the sight will not seat in the sight housing. By maintaining a downward pressure on the range knob and pushing forward or rearward with the thumb, the range knob will rotate against the housing and drop into the housing when the battle sight setting is reached, and the range knob will no longer rotate.

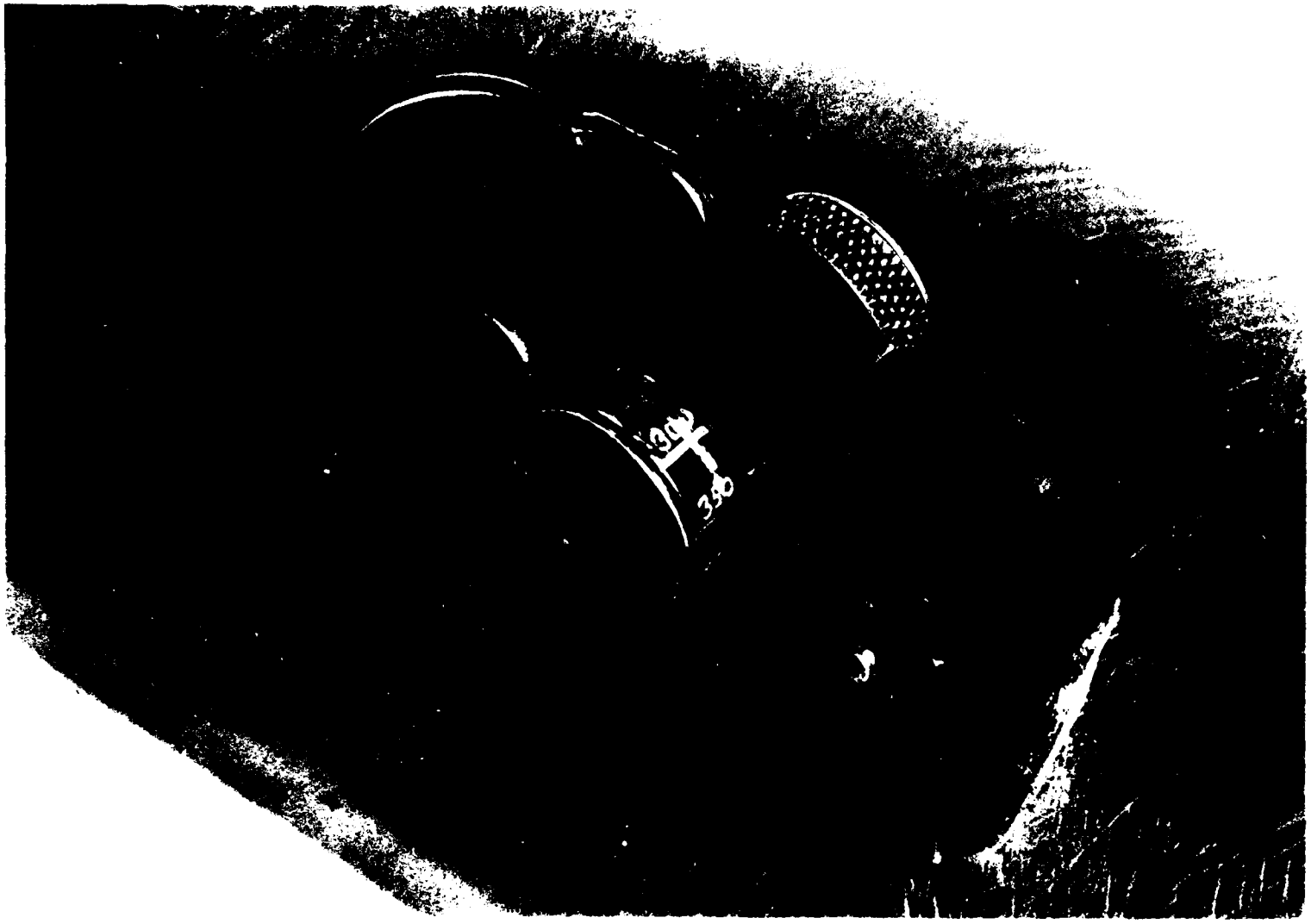

Figure 1. Sight A Stowed position.

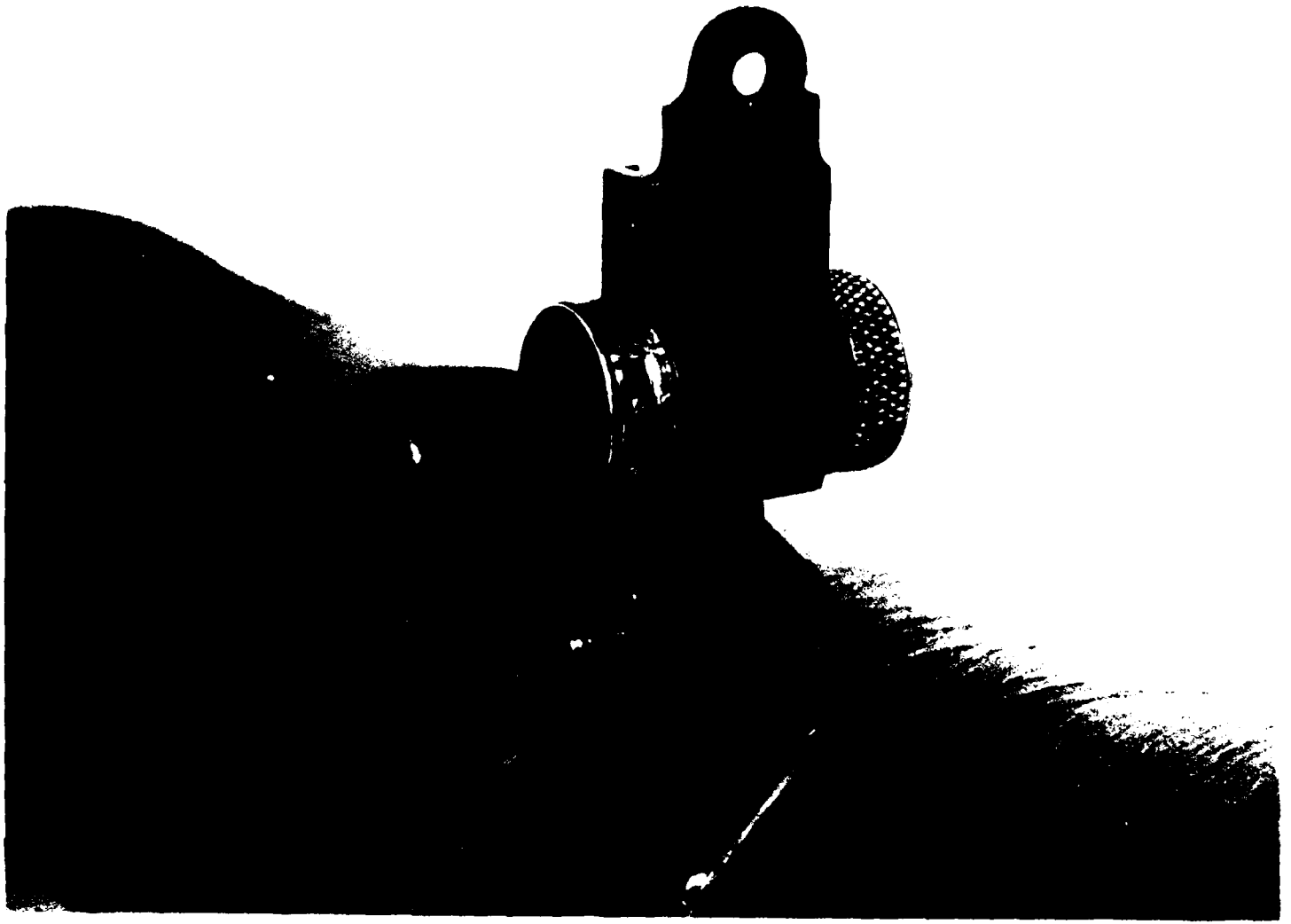

Figure 2. Sight A -Ready to fire position.

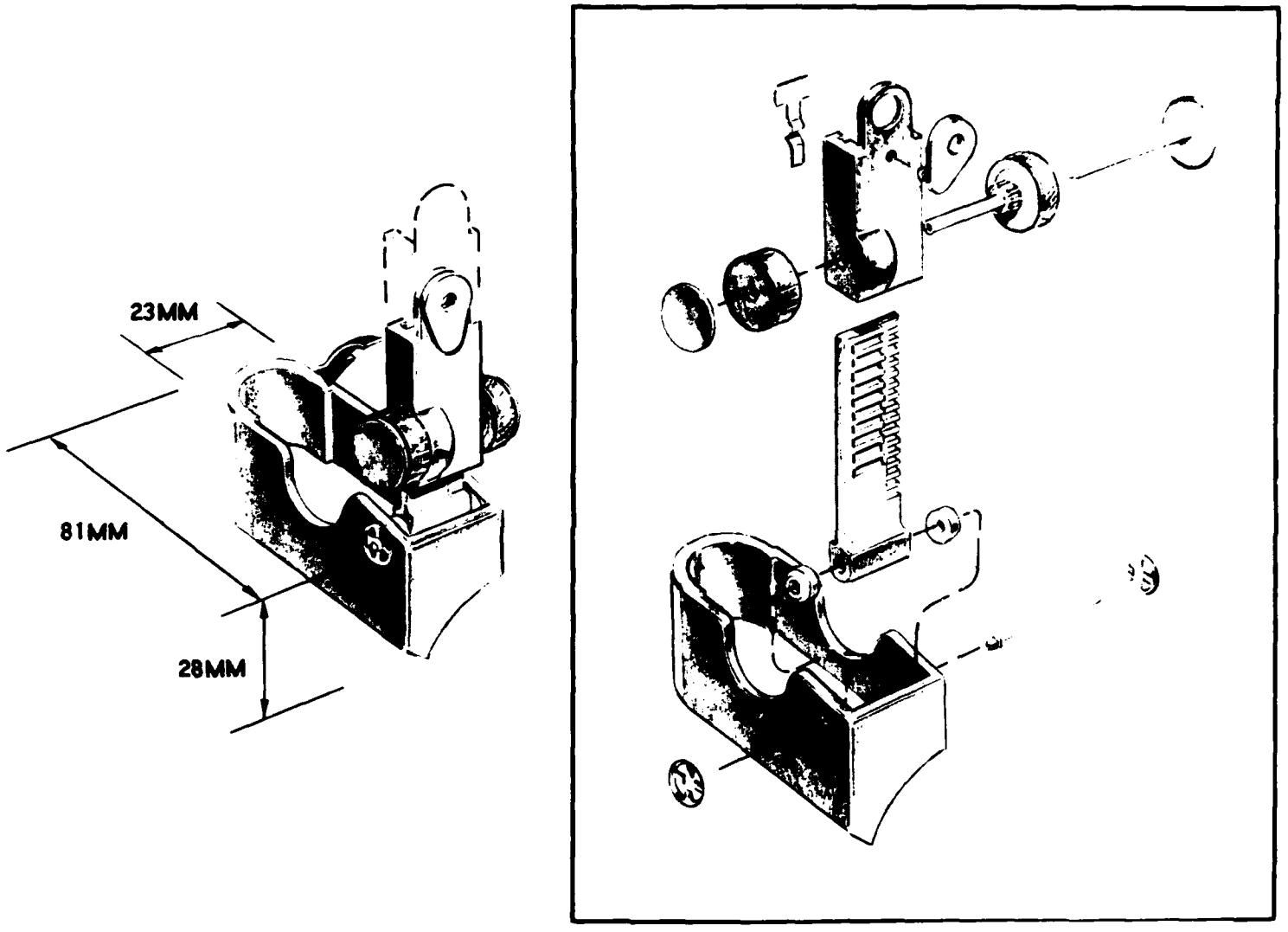

Figure 3. Sight A--Sketch with exploded view.

Sight B

Sight B is similar to sight A with respect to range increments, battle sight setting, detents to provide a tactile cue to the gunner at each range increment and two peep hole diameters. Figure 4 shows the sight in the stowed position and Figure 5 shows the sight in the up position. Artist's sketches in Figure 6 show the sight with the cover seen in the previous two figures and with an alternate cover design. An exploded view of the sight is also shown. This sight is unique in that the peep element is a curved transverse section of spring stock.[1] With this sight, range is adjusted by using the right-hand knob and is read from the vertical sight element.

To place the sight in the up position, the gunner grasps the rear portion of the sight cover between his right thumb and index finger and slides the cover forward until the stop at the rear of the cover is against the stop at the forward end of the sight housing. When the cover has been moved almost completely forward, the peep portion of the sight, which has been retained under the sight cover, will spring rearward stopping at the vertical position.

Changing from the smaller to the larger peep and changing the sight setting is done in a manner similar to sight A.

To return the sight to the down position, the gunner first rotates the range knob until the range set on the sight is equal to or greater than the battle sight setting. At this time, the flat spot on the inside of the range adjustment knob will be parallel to the top of the sight housing or rotated forward as shown in Figure 6. Then, with his thumb, the gunner pushes forward and downward on the peep insert, rotating the sight element forward until the upper portion of the peep element is slightly below the bottom of the sight cover. With the thumb still on the sight peep, the cover is slid rearward by the right index finger until the rear edge of the cover is over the end of the peep. The peep element will now be retained under the cover. The thumb is then removed and the cover slid to the full rearward position and covers the sight.

To place the sight onto operation with the alternate cover on the sight, the gunner pushes upward with his thumb on the rear portion of the cover. In the closed position (not shown in the figures), the rear portion of the cover extends beyond the sight housing and the cover is retained in the closed position by a detent on the cover. Also not shown, is a coil spring which would rotate the cover forward when the detent is disengaged.

To return the sight to the stowed position (with the alternate cover on the sight), the gunner pushes forward and downward on the peep insert with his right thumb until the peep element is at an angle less than 45 degrees with respect to the sight housing. The gunner then places the first digit of the right index finger under the sight cover, forward of the hinge-point, and rotates the cover to the rear and down. (When the cover is at an angle less than 45 degrees with respect to the top of the sight housing, the cover will hold the sight element in place.) The gunner then removes his thumb and continues rotating the cover forward and downward until the detent on the cover engages the sight housing.

With this cover, it is not necessary that the range be set at the battle sight setting when stowing the sight because closing the sight cover cams the range knob into the battle sight setting. A different range knob than the one shown in Figure 6 is required for this operation. The forward portion of the inside flat edge of the knob is rounded to mate with the triangular portion of the sight cover and cam the sight into the battle sight setting when the setting on the sight is less than the range for the battle sight setting. The flat portion of the sight cover cams the sight into the battle sight setting in a manner similar to that with the previous cover.

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[1] A section from a steel tape measure was used to fabricate the peep element.

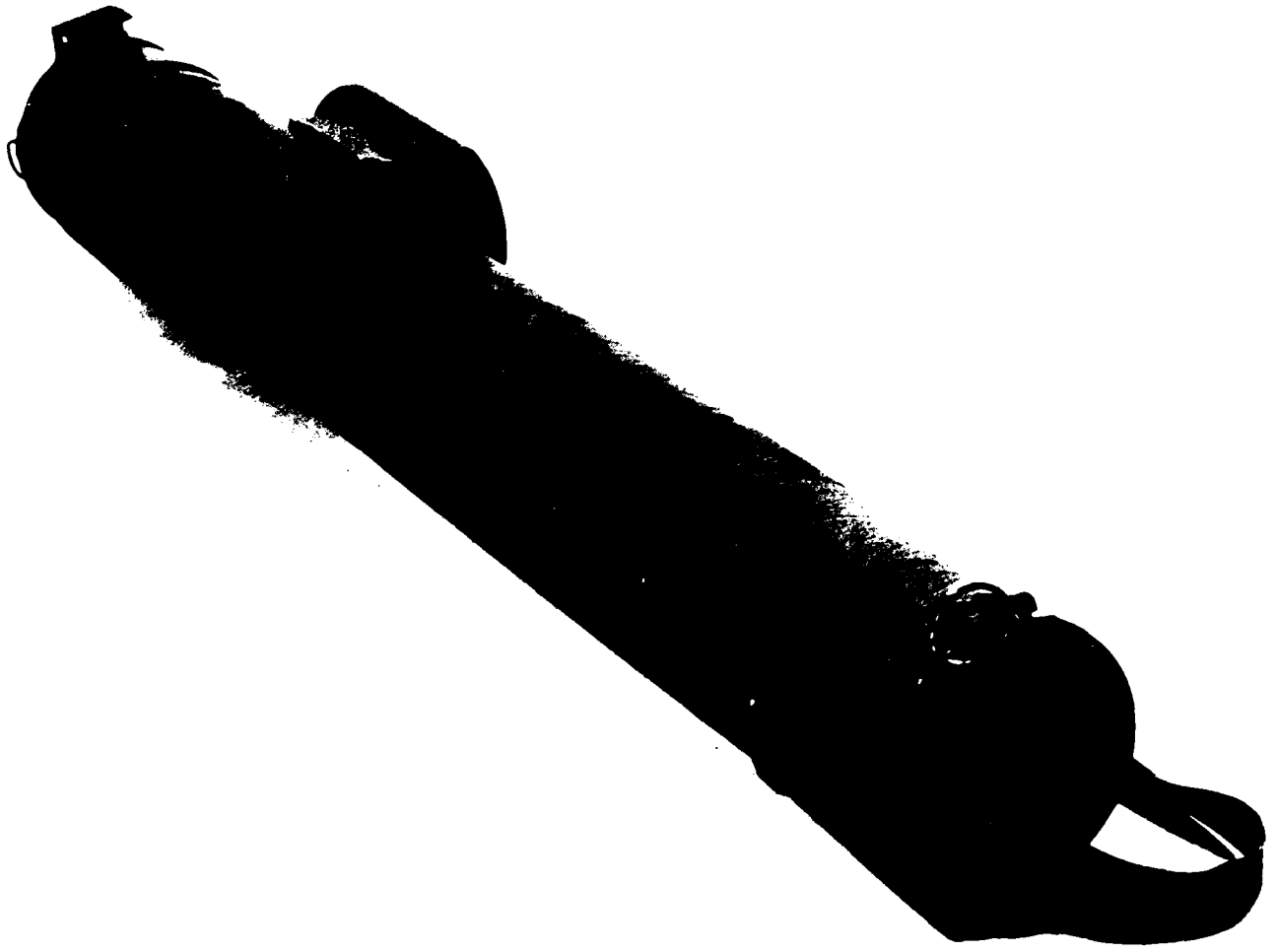

Figure 4. Sight B - Stowed position.

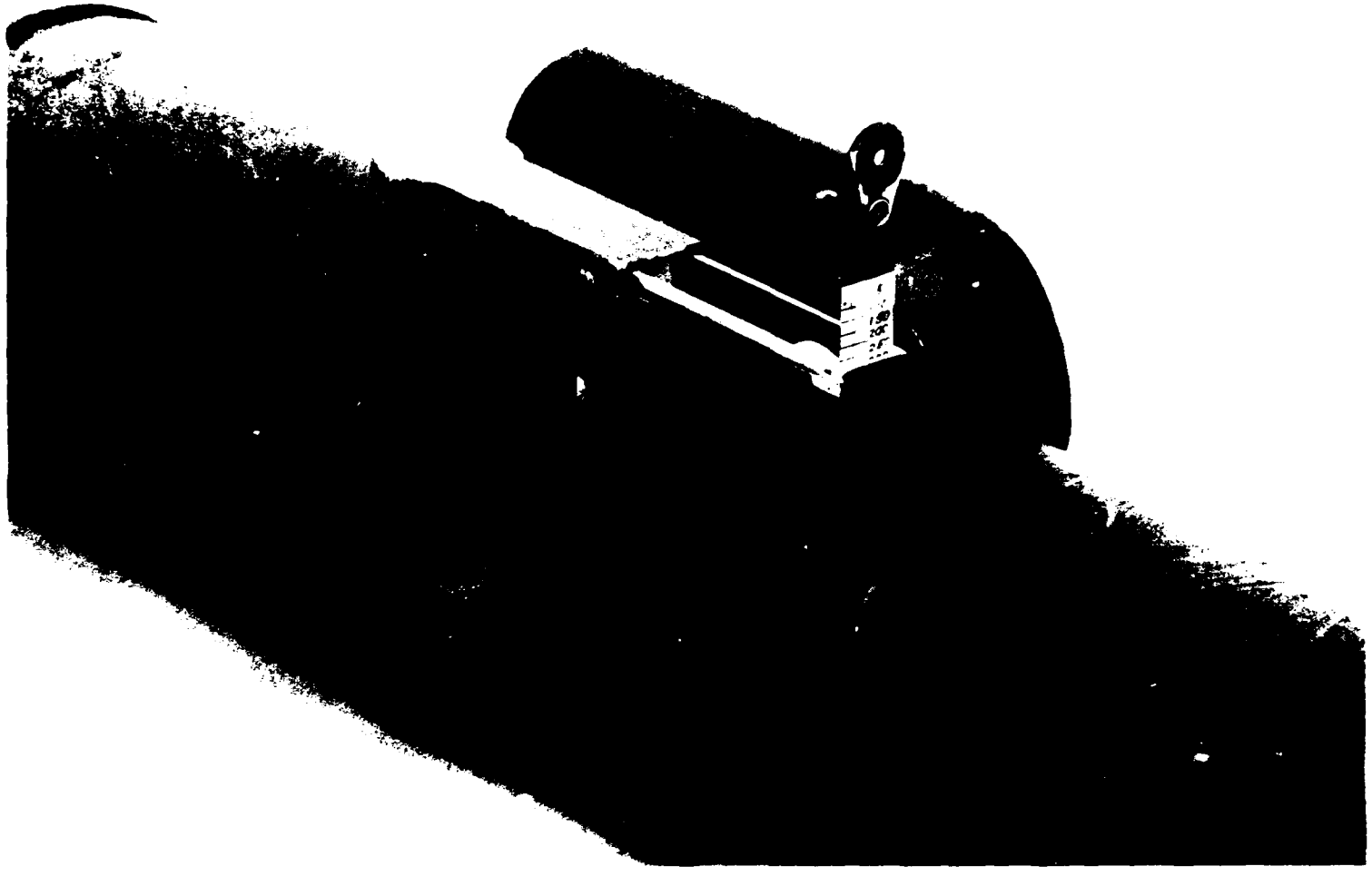

Figure 5. Sight B - Ready to fire position.

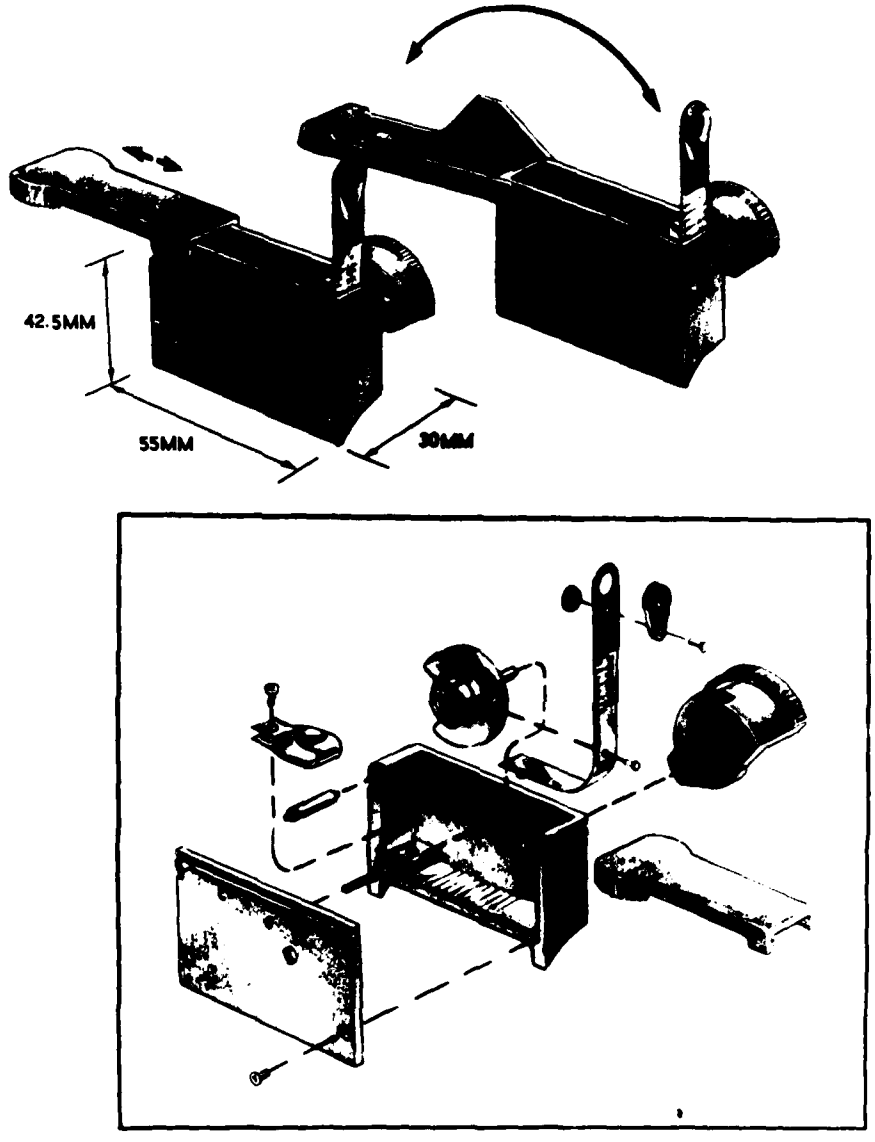

Figure 6. Sight B— Sketch with exploded view.

Sight C

Sight C, which is shown in Figures 7 through 9, was designed so that extending the launcher for firing releases the front and rear sight from an enclosure and the sights spring up set at the fixed QE range.

The weapon is shown in the carry position in Figure 7. To prepare for firing, the gunner pulls on the cord shown to the left of the sight enclosure and pulls towards the front of the weapon (right side of the figure). This action pulls off the enclosure cover and then the front end cap which is attached to the cover.

The weapon with sight enclosure cover and end cap removed is shown in Figure 8. The front sight is shown inside the sight enclosure. The rear sight is retained in the enclosure by the post on the front sight. When the weapon is extended by pulling forward on the front section, the sight pops up to the position shown in Figure 9. (Not shown in this figure are lead posts on the front sight.)

Range is adjusted with this sight by rotating the knob on the right side of the rear sight. Range is read from markings in the middle of the rear sight (where the white index mark is shown).

This sight uses a flip-over day-light low-light sight peep similar to one on the M16 rifle low-light level sight kit.

When placed in the sight housing, the sight automatically returns to the fixed QE position via the flat on the range knob.

When returning the weapon to the carry configuration, the rear sight is rotated forward into the housing, the front sight rotated rearward against the weapon and the weapon collapsed so that the front sight slips into the sight housing and the post rests on and retains the peep sight inside the enclosure.

Sight D

Sight D is shown in Figure 10. Operation of this sight is similar to those previously described. Opening the cover causes the sight to spring rearward (spring section not shown in Figure 10) into position at the fixed QE range. The sight uses the flip-over peep and a range knob and indicator design similar to sight C, except that the range adjuster is two posts on the range knob. The triangular section at the base of the peep mechanism mates with the two posts to automatically cam the sight into fixed QE when the sight is stowed.

The sight is shown in Figure 10 with a cover that also serves as a trigger mechanism. After examining the design prototype, it was concluded that a separate trigger mechanism would be more desirable. A cover that hinges either forward or to the left side of the sight would be more appropriate.

Figure 7. Sight C– Stowed position with cover on.

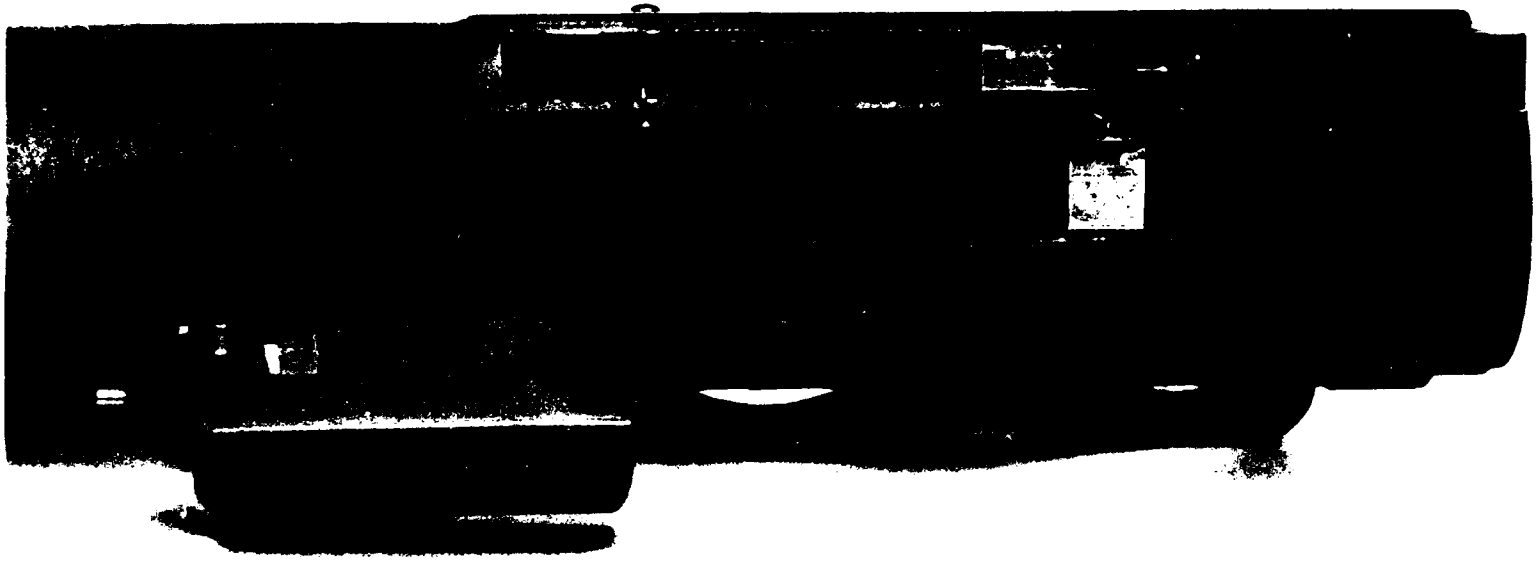

Figure 8. Sight C Stowed position with cover removed.

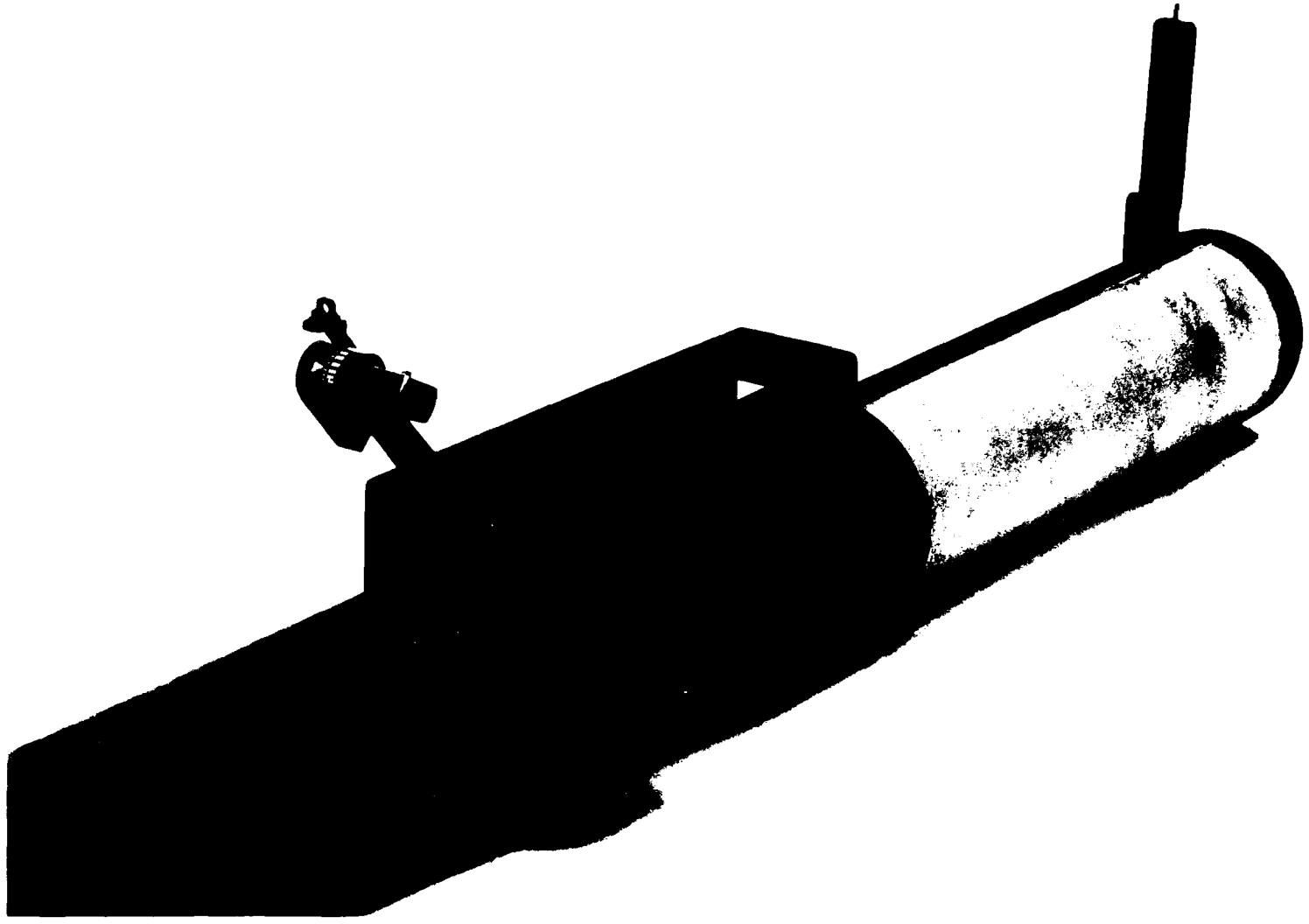

Figure 9. Sight C– Ready to fire position.

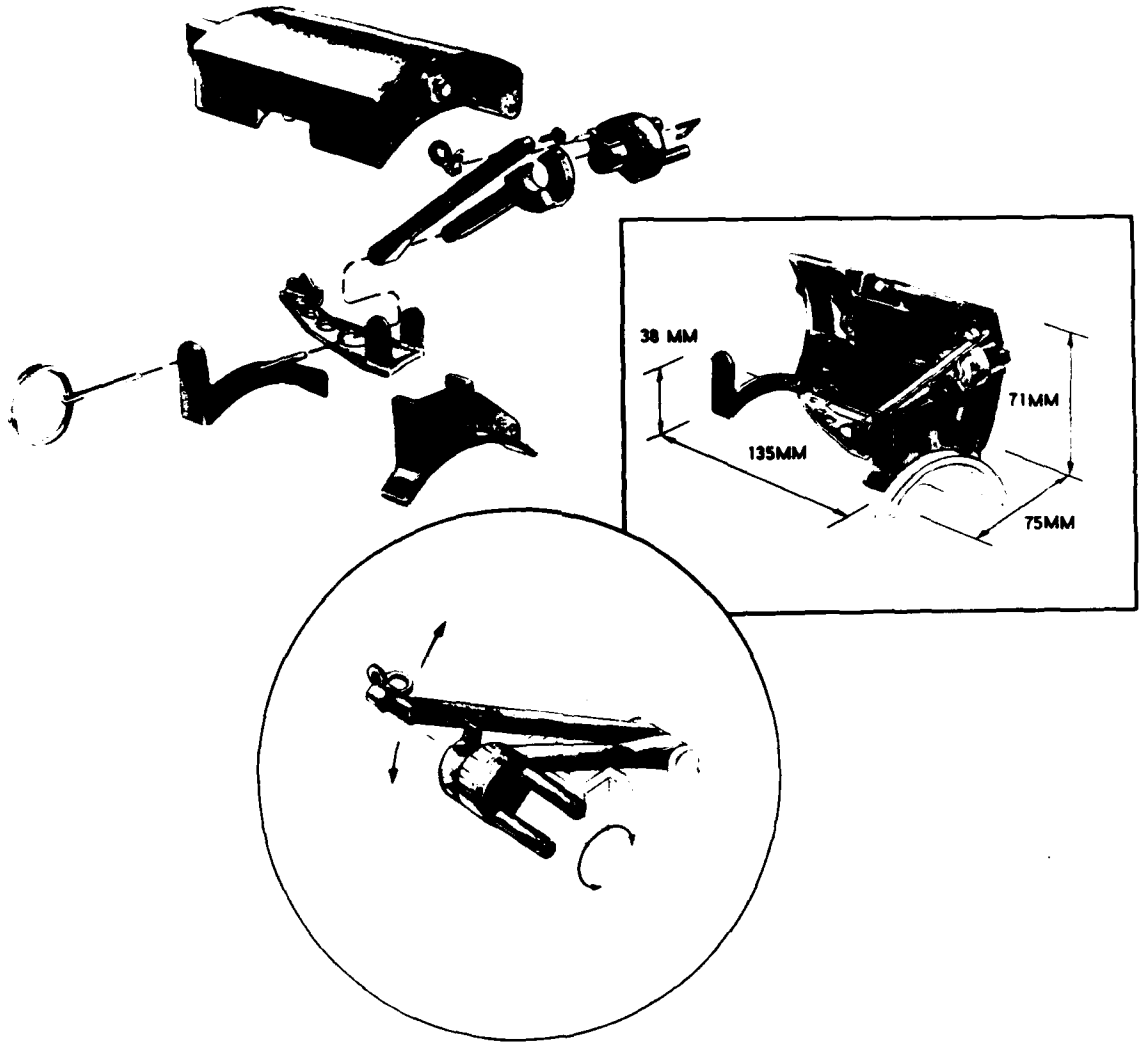

Figure 10. Sight D– Sketch with exploded view.

Sight E

The rear sight shown in Figure 11 was designed and built by MIRADCOM subsequent to delivery of the HEL sight prototypes. It is designed for use with a front reticle and uses the concentric day- low-light level peep design from the HEL sights. The rear sight is designed to operate a Safety and protect the trigger when in the stowed position. Figure 12 is a sketch of this rear sight mechanism and a front reticle containing range lines, a fixed QE aiming point (a circle at 250 meters) and lead lines. In this sight design, the rear sight is both a Safety and a trigger cover.

End Caps and Shoulder Stop

In addition to examining designs for sights, we also examined designs for end caps, shoulder stop and carrying straps. One design, shown in Figure 13, is similar to the M72 except that the rear end cap is a shoulder stop, whereas the rear end cap on the M72 is not. Another design, shown in Figure 14, uses a shoulder stop similar to one on the "mini-man." Both designs utilize the same front end cap, a coil spring attaching the end cap to a steel band that runs the length of the weapon, and a carrying strap attached between the ends of the steel band.

To remove the end caps in both designs, the gunner removes the retainer pin on the rear end cap and pulls the top of the end cap to the rear and down to break the seal between the weapon and the foam rubber on the inside of the end cap. Then, for the design shown in Figure 13, the coil spring at the pivot point of the end cap arm forces the end cap in the direction shown by the arrow. For the design shown in Figure 14, the end cap falls away and the shoulder stop springs *downward as shown in the figure.*

In the latter design, the spring on the shoulder stop may be unnecessary; it may also be undesirable. If the gunner discards the end caps and must carry the weapon for some distance prior to firing it, the protruding shoulder stop might present a hazard. If the spring was not used, a piece of velcro fabric on the end of the shoulder stop and a mating piece of velcro fabric on the underside of the weapon, would hold the shoulder stop against the weapon.

Double Hinging Front Post

If the front sight post is normally retained under an end cap and a gunner removes and discards the end caps without firing the weapon, the front post shown in Figures 13 and 14 would always be in the up position and could become snagged in underbrush or become bent or broken. It also presents a possible hazard to the gunner; for example, if he fell onto the weapon. One solution would be a front post made of a thin flexible plastic. Another is the front post shown in Figure 15.

This front post can be stored down on the outside of the weapon as well as under the front end cap. A cammed surface on the front post and a leaf spring (in addition to a coil spring used to move the sight from stowed to ready to use position) acts as an over-the-center spring mechanism. If the front post is pushed rearwards until the angle between the weapon bore and the front post is less than 45 degrees, the flat spring, in combination with the coil spring, pushes the front post down onto the weapon. Conversely, by raising the front post from this position until the angle between the front post and the weapon bore is greater than 45 degrees, the flat spring pushes the front post to the up position.

Figure 11. Sight L. Ready to fire position.

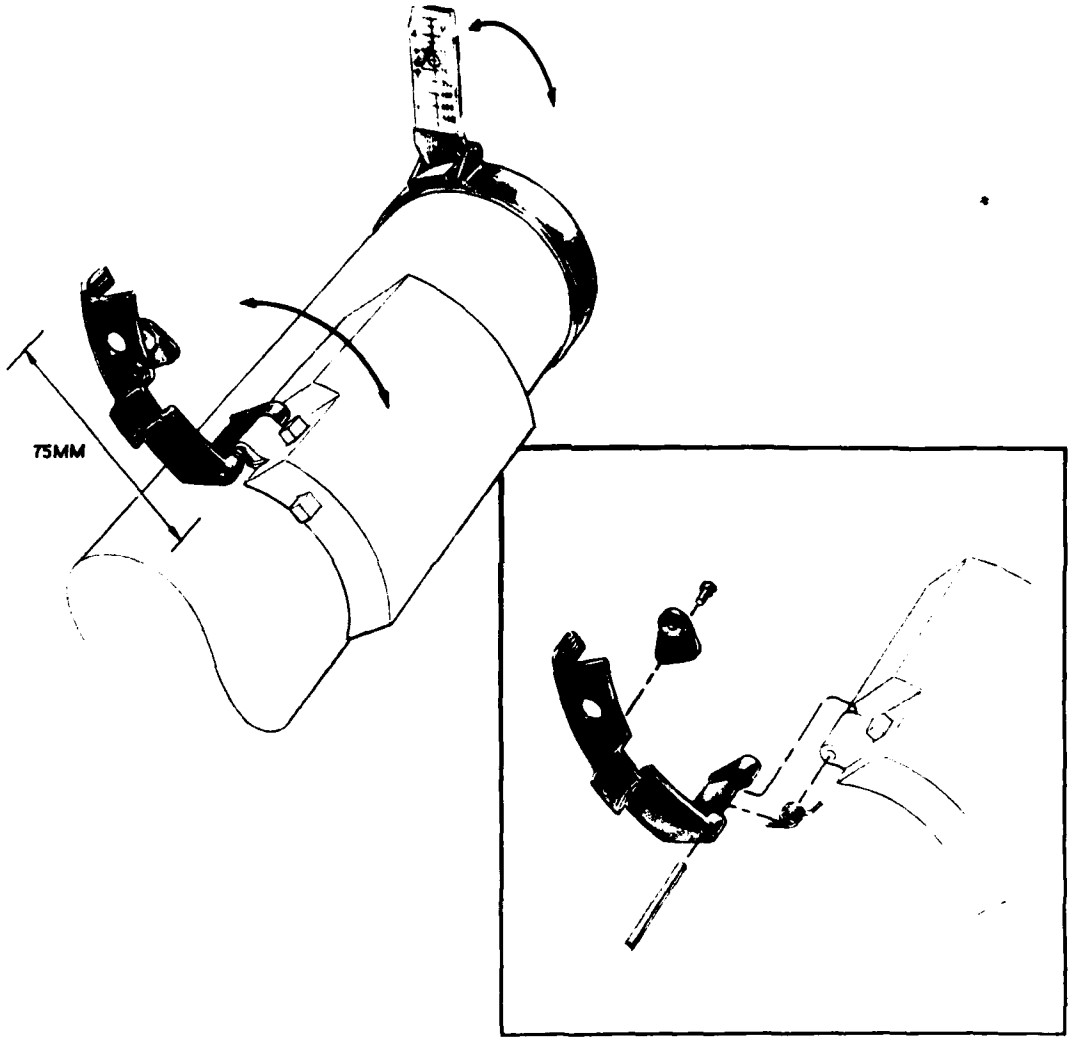

Figure 12. Sight E– Sketch with front reticle and exploded view.

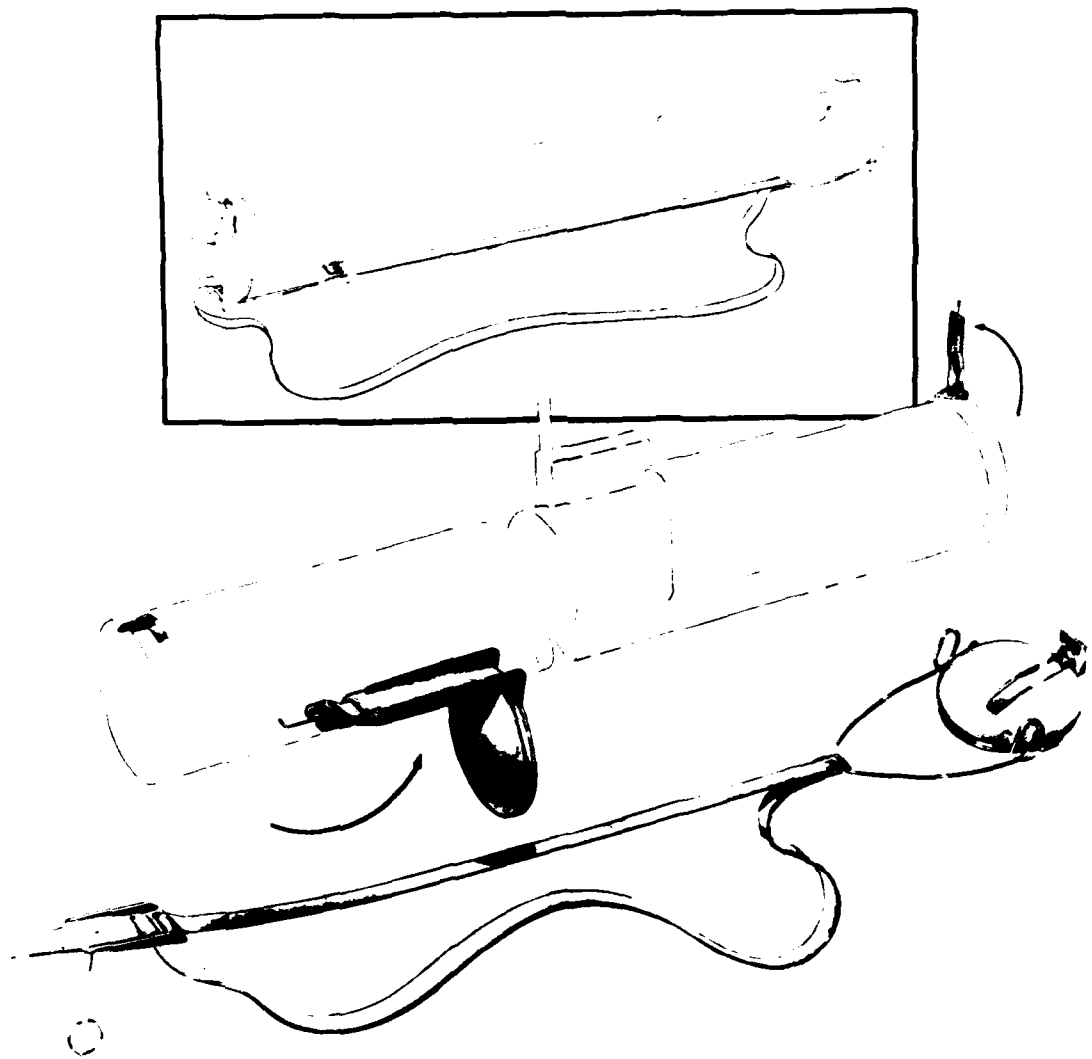

Figure 13. End cap and shoulder stop design with dual purpose end cap.

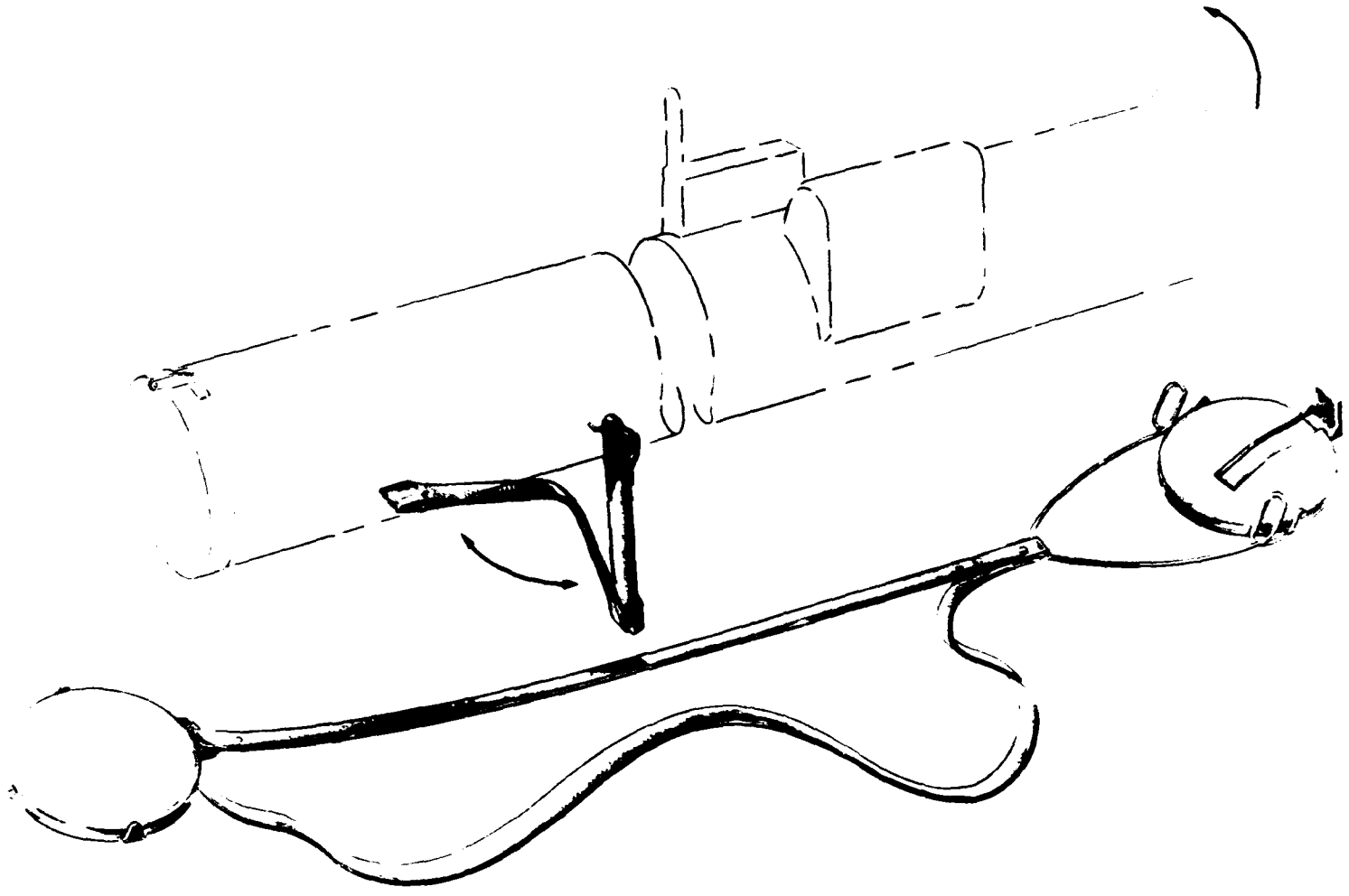

Figure 14. End cap and shoulder stop design with separate shoulder stop.

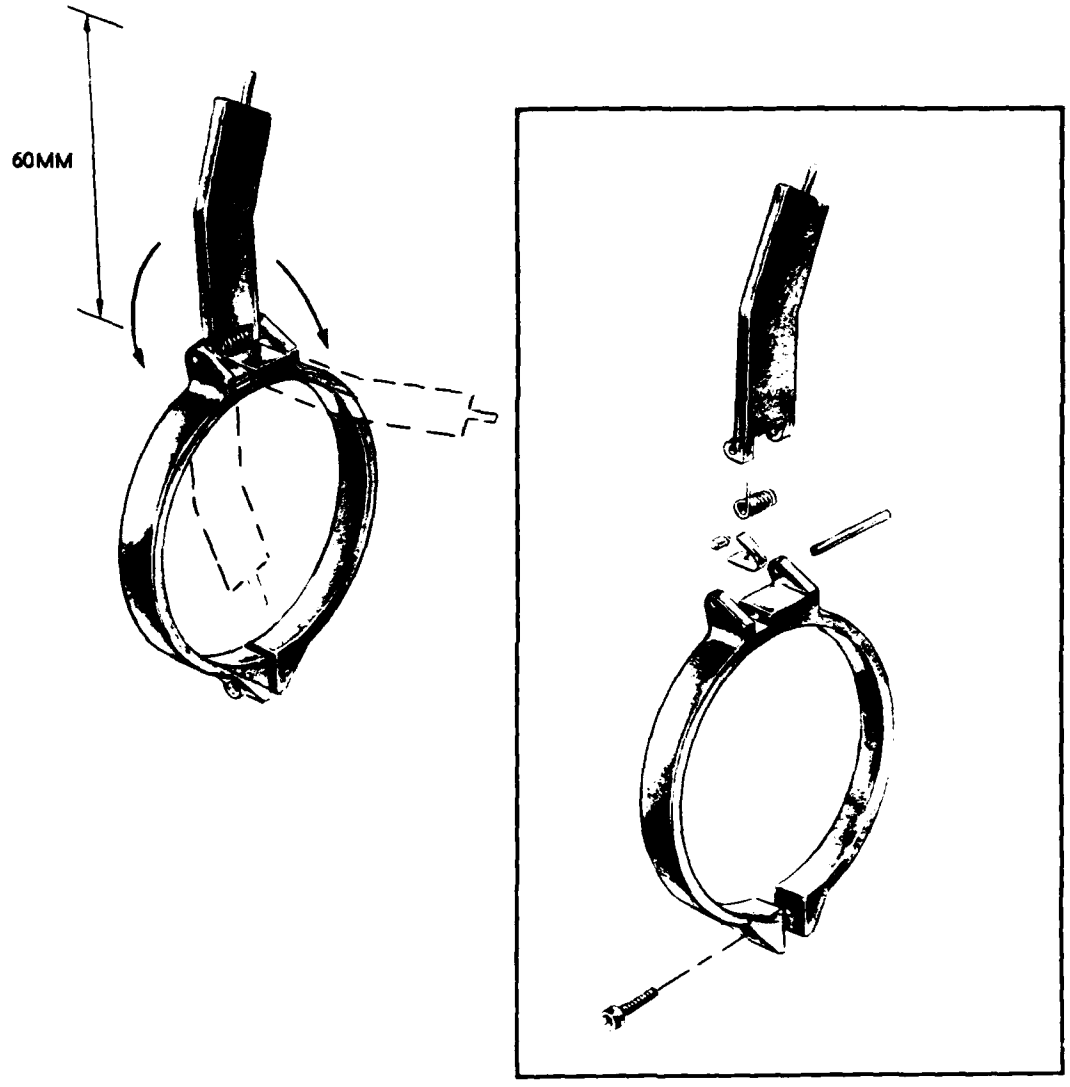

Figure 15. Dual hinging front post.

The designs of the cammed surface on the front post and the leaf and coil springs are interdependent. The coil spring must have sufficient force to raise the sight to the up position when the front end cap is removed, but not so strong as to overcome the counter force of the flat spring when the front blade reaches the up position.

Mount for an Optical Sight

Although we did not and are not recommending use of an optical sight on the weapon, we did examine methods of mounting one. As with the non-optical sights, we wanted (1) the sight and its mount to add a minimum of bulk to the weapon, (2) the sight to be protected in the stowed position, and (3) the placement of the sight in the up position to be quickly and easily accomplished. Sketches showing a small 3-power optical sight mounted to the weapon are shown in Figure 16.

Placement of the sight in the up position is relatively easy and can be done with either the right or left hand. The steps are: remove the front cap from the sight and rotate the sight mount counterclockwise. A detent maintains the sight in the closed position. When it is disengaged, a coil spring (shown in the figure) forces the sight to the up position. To place the sight in the stowed position, the rubber eyepiece must first be compressed forward so that it will fit under the protective cap at the top rear of the trigger mechanism. Next, the sight mount is rotated clockwise until the detent is engaged, and the front cap replaced on the sight.

CONCLUSION

It was concluded that the simple mechanical sight designs provided herein be used as guidelines for the development of the VIPER sight.

RECOMMENDATION

Upon delivery of the sight prototypes and drawings and at the start of the I-LAW and VIPER programs, it was recommended that the sight designs described in this report serve as guidelines to the VIPER contractor in the development of a weapon sight. Although somewhat delayed, this recommendation was implemented and the VIPER sight is a modification of Sight A.

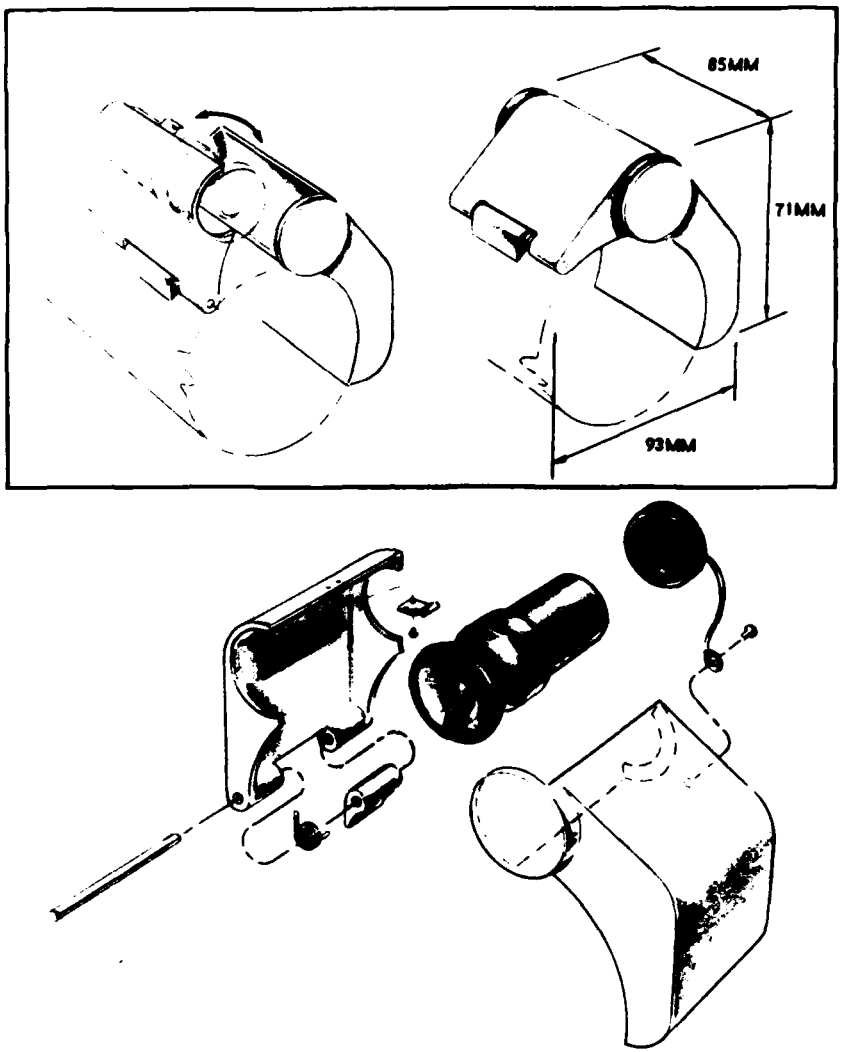

Figure 16. Optical sight mount--sketch with exploded view.

REFERENCES

1. Giordano, D.J. Sights for light antitank weapons. Technical Memorandum 11-76, U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD, April 1976.

2. Giordano, D.J. Location of sights and trigger mechanism and time to fire for a new infantry shoulder-fired antitank weapon (VIPER). Technical Memorandum 16-78, U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD, June 1978.

APPENDIX A

REQUIRED HUMAN FACTORS FEATURES FOR THE VIPER

Required Human Factors Features for the VIPER

1. Must not be capable of being fired unless tube is fully extended.

2. Upon closing the extended tube, weapon must automatically return to safe.

3. Must possess separate Safety.

4. Safety must be clearly marked. It must be located so that it is not capable of moving from Safe to an Unsafe position by catching, bumping, etc.

5. When Safety goes from either the safe to ready-to-fire or the reverse condition, it must be possible to clearly see the ready-to-fire position visually. In addition, the transition must be clearly identifiable tactually and, if possible, audibly.

6. Safety must be operable while hands are in firing position.

7. The Safety must require a movement dissimilar to that required to actuate the trigger.

8. Shoulder positioner must be designed in accordance with anticipated recoil. It must be stored in non-obtrusive position and must not interfere with carrying strap.

9. The carrying strap must be positioned so that the tube presents a smooth surface to the body when slung.

10. Operating instructions must be clearly visible on the exterior of the weapon. They must include the identification of the Safety, trigger, sight, shoulder position, extended position and firing position. The instructions must indicate the proper sequence of operations necessary to fire the weapon.

11. The entire weapon must be non-reflective.

12. The sight must possess day and night rear aperture.

13. The sight must possess luminous material on the front post.

14. The sight must possess automatic battle-sight setting.

15. The sight must possess proper range increments.

16. The front post must be TBD[1] wide. It must be TBD high from the shoulder. TBD from the post top there should be right angle projections to either side reflecting a TBD lead. The M16 front post conversion for night use may be a good contender.

17. Sight increments must have visual, tactile and, if possible, audible increments.

18. Obviously, sights, Safety and trigger must be designed so that they do not accumulate dirt, moisture, etc., so they prevent easy operation.

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[1]TBD– To be determined.

19. Total system must be capable of going from carry position to ready to fire without taking longer than the current LAW.

20. A positive latch and visual marking for full extension should be provided.

21. The latch prevents collapse of the tube without action on the part of the soldier.

22. The end caps must be capable of complete removal easily or, if retained, stowable in a non-interfering manner.

23. Tube must be capable of extension without adjusting carrying strap.

Desired Features:

1. If trigger protection and sight protection are required, they should be removed simultaneously.

2. The most desired design is one that requires a mere tube extension and removal of the Safety to fire, and be easily restowed by one man.

The trigger location, sight location, shoulder position location, interrelationships, and trigger push force and travel distance, front sight luminance values and final sight design will be provided in the near future.

APPENDIX B

LIST OF ABBREVIATIONS

DARCOM–	US Army Materiel Development and Readiness Command
HEL–	US Army Human Engineering Laboratory
I-LAW–	Improved Light Antitank Weapon
LAW-T–	Light Antitank Weapon Technology (program)
MIRADCOM–	US Army Missile Research and Development Command
QE–	Quadrant elevation (or superelevation) set on the weapon
SMAWT–	Short Range Man-Portable Weapon Technology (program)
VIPER–	Weapon under development to replace the M72A2 LAW (not an acronym)


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